



# PARTIAL FCC TEST REPORT (15.407)

**REPORT NO.:** RF130506C21-1  
**MODEL NO.:** TP00042A  
**FCC ID:** GKR-TP00042AKP  
**RECEIVED:** May 05, 2013  
**TESTED:** May 14, 2013 ~ May 23, 2013  
**ISSUED:** May 27, 2013

**APPLICANT:** COMPAL ELECTRONICS, INC.

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**ISSUED BY:** Bureau Veritas Consumer Products Services  
(H.K.) Ltd., Taoyuan Branch

**LAB ADDRESS:** No. 47, 14th Ling, Chia Pau Vil., Lin Kou Dist.,  
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**TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei  
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## TABLE OF CONTENTS

RELEASE CONTROL RECORD	3
1. CERTIFICATION	4
2. SUMMARY OF TEST RESULTS	5
2.1 MEASUREMENT uncertainty	5
3. GENERAL INFORMATION	6
3.1 GENERAL DESCRIPTION OF EUT	6
3.2 DESCRIPTION OF TEST MODES	7
3.2.1 Test Mode Applicability and tested channel detail	8
3.3 DESCRIPTION OF SUPPORT UNITS	9
3.3.1 CONFIGURATION OF SYSTEM UNDER TEST	9
3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS	9
4. TEST TYPES AND RESULTS	10
4.1 Radiated Emission AND BANDEDGE Measurement	10
4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT	10
4.1.2 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS	10
4.1.3 TEST INSTRUMENTS	11
4.1.4 TEST PROCEDURES	12
4.1.5 DEVIATION FROM TEST STANDARD	12
4.1.6 TEST SETUP	13
4.1.7 EUT OPERATING CONDITION	13
4.1.8 Test RESULTS	14
5. PHOTOGRAPHS OF THE TEST CONFIGURATION	25
6. INFORMATION ON THE TESTING LABORATORIES	26
7. APPENDIX A - Modifications recorders for engineering changes to the eut BY THE LAB	27



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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130506C21-1	Original release	May 27, 2013



## 1. CERTIFICATION

**PRODUCT:** Convertible Tablet Computer, ThinkPad S230u  
**MODEL NO.:** TP00042A  
**BRAND:** Lenovo  
**APPLICANT:** COMPAL ELECTRONICS, INC.  
**TESTED:** May 14, 2013 ~ May 23, 2013  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**STANDARDS:** **FCC Part 15, Subpart E (Section 15.407)**  
ANSI C63.10-2009

The above equipment (model: TP00042A) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**PREPARED BY** : Ivonne Wu , **DATE** : May 27, 2013  
Ivonne Wu / Senior Specialist

**APPROVED BY** : Sam Chen , **DATE** : May 27, 2013  
Sam Chen / Assistant Manager

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART E (SECTION 15.407)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.407(b)(6)	AC Power Conducted Emission	NA	Refer to Note
15.407(b/1/2/3) (b)(6)	Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -5.17dB at 332.9MHz.
15.407(a/1/2)	Peak Transmit Power	NA	Refer to Note
15.407(a)(6)	Peak Power Excursion	NA	Refer to Note
15.407(a/1/2)	Peak Power Spectral Density	NA	Refer to Note
15.407(g)	Frequency Stability	NA	Refer to Note
15.203	Antenna Requirement	NA	Refer to Note

**Note:** Only the radiated emission test was performed for this report. Other test data please refer to module report on FCC ID: PD9622ANXHU (File: R76780).

### 2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k = 2$ .

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>EUT</b>	Convertible Tablet Computer, ThinkPad S230u
<b>MODEL NO.</b>	TP00042A
<b>POWER SUPPLY</b>	20Vdc (adapter)
<b>MODULATION TYPE</b>	64QAM, 16QAM, QPSK, BPSK
<b>MODULATION TECHNOLOGY</b>	OFDM
<b>TRANSFER RATE</b>	802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to MCS7
<b>OPERATING FREQUENCY</b>	5180 ~ 5240MHz, 5260 ~ 5320MHz & 5500 ~ 5700MHz
<b>NUMBER OF CHANNEL</b>	5180 ~ 5240MHz: 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz) 5260 ~ 5320MHz: 4 for 802.11a, 802.11n (20MHz) 2 for 802.11n (40MHz) 5500 ~ 5700MHz: 8 for 802.11a, 802.11n (20MHz) 3 for 802.11n (40MHz)
<b>ANTENNA TYPE</b>	Refer to Note as below
<b>ANTENNA CONNECTOR</b>	NA
<b>DATA CABLE</b>	Refer to Note as below
<b>I/O PORTS</b>	Refer to user's manual
<b>ACCESSORY DEVICES</b>	Refer to Note as below

**NOTE:**

1. The module (Intel Centrion Advanced-N + WiMAX 6250, model: 622ANXHMW) is allocated in the EUT.
2. The antenna information is listed as below.

Antenna Type	Brand Name	Parts Number	Antenna Gain
PIFA	Jess-Link Products CO., LTD.	Main Antenna: PANT11A00034-1	<b>5150~5350MHz: -0.59</b> <b>5470~5725MHz: 0.21</b>
		Auxiliary Antenna: PANT11A00035-1	<b>5150~5350MHz: -0.07</b> <b>5470~5725MHz: -0.08</b>

3. The EUT contains following accessory devices.

ITEM	BRAND	MODEL	SPECIFICATION
Adapter	lenovo	45N0185	I/P: 100-240Vac, 50/60Hz, 1.5A O/P: 20Vdc, 3.25A 1.8m non-shielded cable with ferrite core

4. The above EUT information is declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 DESCRIPTION OF TEST MODES

#### FOR 5180 ~ 5240MHz

4 channels are provided for 802.11a, 802.11n (20MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n (40MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
38	5190 MHz	46	5230 MHz

#### FOR 5260 ~ 5320MHz

4 channels are provided for 802.11a, 802.11n (20MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
52	5260 MHz	60	5300 MHz
56	5280 MHz	64	5320 MHz

2 channels are provided for 802.11n (40MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
54	5270 MHz	62	5310 MHz

#### FOR 5500 ~ 5700MHz

8 channels are provided for 802.11a, 802.11n (20MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
100	5500MHz	116	5580MHz
104	5520MHz	132	5660MHz
108	5540MHz	136	5680MHz
112	5560MHz	140	5700MHz

3 channels are provided for 802.11n (40MHz):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
102	5510MHz	134	5670MHz
110	5550MHz		

### 3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO		DESCRIPTION
	RE $\geq$ 1G	RE<1G	
A	√	√	EUT with antenna A (NB Mode)
B	√	√	EUT with antenna A+B (NB Mode)
C	√	-	EUT with antenna A (Pad Mode)
D	√	√	EUT with antenna A+B (Pad Mode)

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz      **RE<1G**: Radiated Emission below 1GHz  
**PLC**: Power Line Conducted Emission      **APCM**: Antenna Port Conducted Measurement

**NOTE:** The EUT had been pre-tested on the positioned of each 3 axis. The worst case was listed as below.

**NOTE:** The system antenna type is the same as module antenna type, so Radiated Spurious Emission is re-tested on worst channel of the module report, which is FCC ID PD9622ANXHU.

**NOTE:** The EUT had been pre tested on NB mode and Pad mode for all bands, and only the worst case was presented in this report.

#### **RADIATED EMISSION TEST (ABOVE 1GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)	AXIS
A	802.11a	5180-5240	36 to 48	36	OFDM	BPSK	6.0	Z
B	802.11n (40MHz)		38 to 46	38	OFDM	BPSK	HT8	Z
C	802.11a	5260-5320	52 to 64	64	OFDM	BPSK	6.0	Y
D	802.11n (40MHz)		54 to 62	62	OFDM	BPSK	HT8	Y
A	802.11a	5500-5700	100 to 140	100, 140	OFDM	BPSK	6.0	Z
D	802.11n (40MHz)		102 to 134	102, 134	OFDM	BPSK	HT8	Z

#### **RADIATED EMISSION TEST (BELOW 1GHz):**

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	FREQ. BAND (MHz)	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
A	802.11a	5180-5240	36 to 48	36	OFDM	BPSK	6.0
C	802.11a	5260-5320	52 to 64	64	OFDM	BPSK	6.0
A	802.11a	5500-5700	100 to 140	140	OFDM	BPSK	6.0



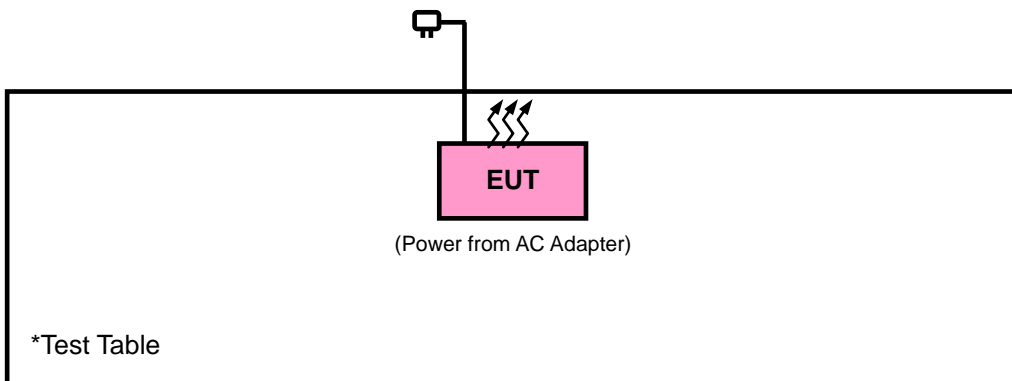
**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Johnson Liao
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	David Huang

**3.3 DESCRIPTION OF SUPPORT UNITS**

The EUT has been tested as an independent unit.

**3.3.1 CONFIGURATION OF SYSTEM UNDER TEST**



**3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS**

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart E (15.407)**

ANSI C63.10-2009

KDB 789033 D01 General UNII Test Procedures v01r02

All test items have been performed and recorded as per the above standards.

## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table:

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

#### 4.1.2 LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

APPLICABLE TO	LIMIT	
	FIELD STRENGTH AT 3m (dBµV/m)	
	PK	AV
	74	54
√	EIRP LIMIT (dBm)	EQUIVALENT FIELD STRENGTH AT 3m (dBµV/m)
	PK	PK
	-27	68.3

**NOTE:** The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts).}$$

#### 4.1.3 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100744	Apr. 15, 2013	Apr. 14, 2014
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 17, 2012	Dec. 16, 2013
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Mar. 25, 2013	Mar. 24, 2014
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Jan. 07, 2013	Jan. 06, 2014
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 25, 2012	Dec. 24, 2013
Loop Antenna	HFH2-Z2	100070	Jan. 31, 2012	Jan. 30, 2014
Preamplifier EMCI	EMC 012645	980115	Dec. 28, 2012	Dec. 27, 2013
Preamplifier EMCI	EMC 184045	980116	Dec. 28, 2012	Dec. 27, 2013
Preamplifier EMCI	EMC 330H	980112	Dec. 28, 2012	Dec. 27, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4	Oct. 19, 2012	Oct. 18, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 19, 2012	Oct. 18, 2013
RF signal cable Worken	RG-213	NA	Dec. 29, 2012	Dec. 28, 2013
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Power Meter	ML2495A	1232002	Aug. 10, 2012	Aug. 09, 2013
Power Sensor	MA2411B	1207325	Aug. 15, 2012	Aug. 14, 2013

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  2. The calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
  3. The test was performed in HwaYa Chamber 10.
  4. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  5. The FCC Site Registration No. is 690701.
  6. The IC Site Registration No. is IC 7450F-10.

#### 4.1.4 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

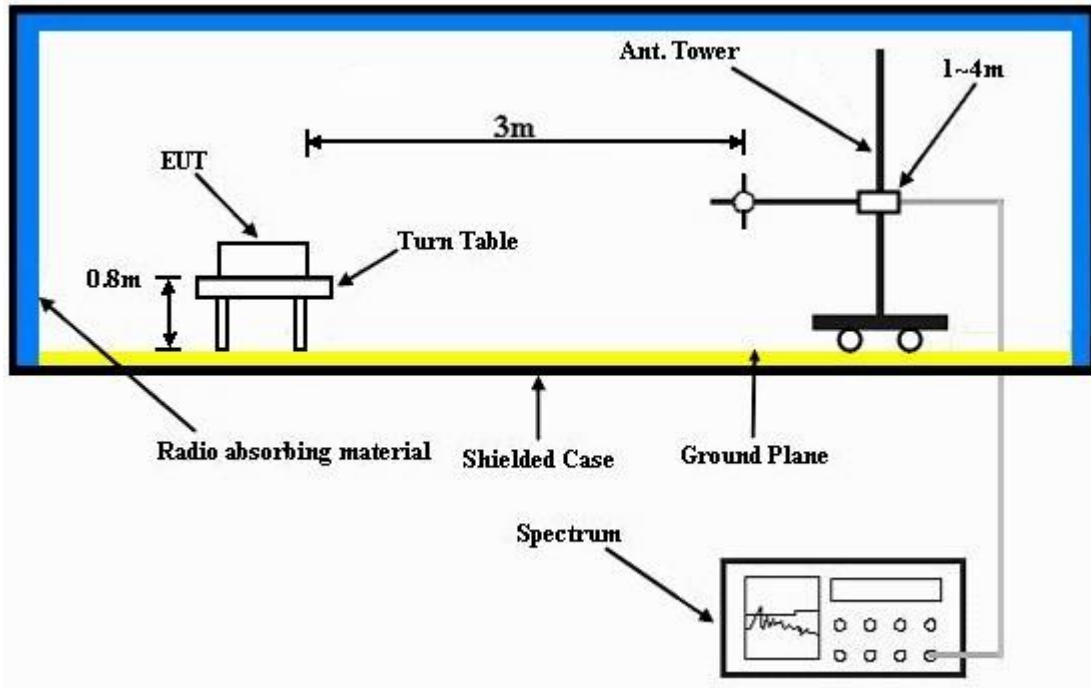
**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 1kHz for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.5 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.1.6 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.1.7 EUT OPERATING CONDITION

- a. Placed the EUT on a testing table.
- b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

#### 4.1.8 TEST RESULTS

##### ABOVE 1GHz DATA:

Mode A

802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	1GHz ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Johnson Liao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5150	40.13	38.8	54	-13.87	31.32	7.33	37.32	100	15	Average
5150	51.95	50.62	74	-22.05	31.32	7.33	37.32	100	15	Peak
5180	88.12	86.79			31.35	7.32	37.34	100	15	Average
5180	96.51	95.18			31.35	7.32	37.34	100	15	Peak
5440	40.26	38.37	54	-13.74	31.55	7.47	37.13	100	15	Average
5440	52.32	50.43	74	-21.68	31.55	7.47	37.13	100	15	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5146	39.86	38.53	54	-14.14	31.32	7.33	37.32	103	338	Average
5146	52.51	51.18	74	-21.49	31.32	7.33	37.32	103	338	Peak
5180	86.88	85.55			31.35	7.32	37.34	103	338	Average
5180	96.46	95.13			31.35	7.32	37.34	103	338	Peak
5406	39.99	38.25	54	-14.01	31.52	7.4	37.18	103	338	Average
5406	53.76	52.02	74	-20.24	31.52	7.4	37.18	103	338	Peak

#### REMARKS:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
2. 5180MHz: Fundamental frequency.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 100	FREQUENCY RANGE	1GHz ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Johnson Liao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5460	40.53	38.52	54	-13.47	31.56	7.53	37.08	134	322	Average
5460	53.21	51.2	74	-20.79	31.56	7.53	37.08	134	322	Peak
5470	56.63	54.61	68.3	-11.67	31.57	7.53	37.08	134	322	Peak
5500	88.74	86.58			31.6	7.59	37.03	134	322	Average
5500	98.18	96.02			31.6	7.59	37.03	134	322	Peak
5725	51.68	49.44	68.3	-16.62	31.96	7.71	37.43	134	322	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5426	40.2	38.33	54	-13.8	31.53	7.47	37.13	126	92	Average
5426	54.03	52.16	74	-19.97	31.53	7.47	37.13	126	92	Peak
5470	54.74	52.72	68.3	-13.56	31.57	7.53	37.08	126	92	Peak
5500	86.7	84.54			31.6	7.59	37.03	126	92	Average
5500	96.37	94.21			31.6	7.59	37.03	126	92	Peak
5725	51.01	48.77	68.3	-17.29	31.96	7.71	37.43	126	92	Peak

**REMARKS:**

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
2. 5500MHz: Fundamental frequency.
3. 5470MHz & 5725MHz: Out of restricted band



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 140	FREQUENCY RANGE	1GHz ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Johnson Liao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5456	40.05	38.04	54	-13.95	31.56	7.53	37.08	100	354	Average
5456	51.67	49.66	74	-22.33	31.56	7.53	37.08	100	354	Peak
5470	50.22	48.2	68.3	-18.08	31.57	7.53	37.08	100	354	Peak
5700	89.53	87.34			31.9	7.69	37.4	100	354	Average
5700	99.83	97.64			31.9	7.69	37.4	100	354	Peak
5725	57.86	55.62	68.3	-10.44	31.96	7.71	37.43	100	354	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5436	40	38.11	54	-14	31.55	7.47	37.13	100	196	Average
5436	52.57	50.68	74	-21.43	31.55	7.47	37.13	100	196	Peak
5470	51.01	48.99	68.3	-17.29	31.57	7.53	37.08	100	196	Peak
5700	87.04	84.85			31.9	7.69	37.4	100	196	Average
5700	97.52	95.33			31.9	7.69	37.4	100	196	Peak
5725	55.98	53.74	68.3	-12.32	31.96	7.71	37.43	100	196	Peak

**REMARKS:**

4. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
5. 5700MHz: Fundamental frequency.
6. 5470MHz & 5725MHz: Out of restricted band





A D T

Mode B

802.11n (40MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 38	FREQUENCY RANGE	1GHz ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Johnson Liao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5148	41.84	40.51	54	-12.16	31.32	7.33	37.32	100	345	Average
5148	52.77	51.44	74	-21.23	31.32	7.33	37.32	100	345	Peak
5190	83.84	82.51			31.35	7.32	37.34	100	345	Average
5190	93.43	92.1			31.35	7.32	37.34	100	345	Peak
5358	40.33	38.63	54	-13.67	31.48	7.4	37.18	100	345	Average
5358	51.85	50.15	74	-22.15	31.48	7.4	37.18	100	345	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5142	40.6	39.24	54	-13.4	31.32	7.34	37.3	100	214	Average
5142	51.63	50.27	74	-22.37	31.32	7.34	37.3	100	214	Peak
5190	80.14	78.81			31.35	7.32	37.34	100	214	Average
5190	90.32	88.99			31.35	7.32	37.34	100	214	Peak
5396	40.39	38.65	54	-13.61	31.52	7.4	37.18	100	214	Average
5396	52.02	50.28	74	-21.98	31.52	7.4	37.18	100	214	Peak

REMARKS:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
2. 5190MHz: Fundamental frequency.

Mode C

802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 64	FREQUENCY RANGE	1GHz ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Johnson Liao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5100	39.92	38.57	54	-14.08	31.28	7.35	37.28	100	320	Average
5100	51.09	49.74	74	-22.91	31.28	7.35	37.28	100	320	Peak
5320	89.57	87.91			31.45	7.4	37.19	100	320	Average
5320	99.97	98.31			31.45	7.4	37.19	100	320	Peak
5348	41.02	39.32	54	-12.98	31.48	7.4	37.18	100	320	Average
5348	55.46	53.76	74	-18.54	31.48	7.4	37.18	100	320	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5112	39.59	38.23	54	-14.41	31.29	7.35	37.28	100	72	Average
5112	51.59	50.23	74	-22.41	31.29	7.35	37.28	100	72	Peak
5320	88.67	87.01			31.45	7.4	37.19	100	72	Average
5320	98.23	96.57			31.45	7.4	37.19	100	72	Peak
5352	40.7	39	54	-13.3	31.48	7.4	37.18	100	72	Average
5352	53.81	52.11	74	-20.19	31.48	7.4	37.18	100	72	Peak

REMARKS:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
2. 5320MHz: Fundamental frequency.

Mode D

802.11n (40MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 62	FREQUENCY RANGE	1GHz ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Johnson Liao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5060	40.05	38.8	54	-13.95	31.25	7.25	37.25	100	189	Average
5060	51.67	50.42	74	-22.33	31.25	7.25	37.25	100	189	Peak
5310	84.43	82.77			31.45	7.4	37.19	100	189	Average
5310	94.62	92.96			31.45	7.4	37.19	100	189	Peak
5438	41.62	39.73	54	-12.38	31.55	7.47	37.13	100	189	Average
5438	53.82	51.93	74	-20.18	31.55	7.47	37.13	100	189	Peak
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5072	40.43	39.13	54	-13.57	31.27	7.3	37.27	100	334	Average
5072	51.71	50.41	74	-22.29	31.27	7.3	37.27	100	334	Peak
5310	82.12	80.46			31.45	7.4	37.19	100	334	Average
5310	92.69	91.03			31.45	7.4	37.19	100	334	Peak
5392	40.69	38.96	54	-13.31	31.51	7.4	37.18	100	334	Average
5392	52.36	50.63	74	-21.64	31.51	7.4	37.18	100	334	Peak

REMARKS:

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
2. 5310MHz: Fundamental frequency.



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 102	FREQUENCY RANGE	1GHz ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Johnson Liao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5460	40.84	38.83	54	-13.16	31.56	7.53	37.08	100	215	Average
5460	52.13	50.12	74	-21.87	31.56	7.53	37.08	100	215	Peak
5470	52.63	50.61	68.3	-15.67	31.57	7.53	37.08	100	215	Peak
5510	81.36	79.23			31.6	7.59	37.06	100	215	Average
5510	92.74	90.61			31.6	7.59	37.06	100	215	Peak
5725	50.74	48.5	68.3	-17.56	31.96	7.71	37.43	100	215	Peak

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5390	41.17	39.44	54	-12.83	31.51	7.4	37.18	100	161	Average
5390	51.83	50.1	74	-22.17	31.51	7.4	37.18	100	161	Peak
5470	52.02	50	68.3	-16.28	31.57	7.53	37.08	100	161	Peak
5510	82.72	80.59			31.6	7.59	37.06	100	161	Average
5510	91.42	89.29			31.6	7.59	37.06	100	161	Peak
5725	51.41	49.17	68.3	-16.89	31.96	7.71	37.43	100	161	Peak

**REMARKS:**

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
2. 5510MHz: Fundamental frequency.
3. 5475MHz & 5725MHz: Out of restricted band



A D T

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 134	FREQUENCY RANGE	1GHz ~ 40GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	Johnson Liao

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5434	40.63	38.74	54	-13.37	31.55	7.47	37.13	100	211	Average
5434	52.17	50.28	74	-21.83	31.55	7.47	37.13	100	211	Peak
5470	50.11	48.09	68.3	-18.19	31.57	7.53	37.08	100	211	Peak
5670	80.76	78.56			31.88	7.66	37.34	100	211	Average
5670	90.93	88.73			31.88	7.66	37.34	100	211	Peak
5725	50.72	48.48	68.3	-17.58	31.96	7.71	37.43	100	211	Peak

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
5446	40.91	39.01	54	-13.09	31.56	7.47	37.13	100	352	Average
5446	51.38	49.48	74	-22.62	31.56	7.47	37.13	100	352	Peak
5470	50.01	47.99	68.3	-18.29	31.57	7.53	37.08	100	352	Peak
5670	83.85	81.65			31.88	7.66	37.34	100	352	Average
5670	94.47	92.27			31.88	7.66	37.34	100	352	Peak
5725	50.6	48.36	68.3	-17.7	31.96	7.71	37.43	100	352	Peak

**REMARKS:**

1. Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
2. 5670MHz: Fundamental frequency.
3. 5470MHz & 5725MHz: Out of restricted band

**BELOW 1GHz WORST-CASE DATA :**

Mode A

802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 36	FREQUENCY RANGE	30MHz ~ 1GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	David Huang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
203.07	34.01	54.64	43.5	-9.49	9.48	1.61	31.72	100	158	Peak
256.26	40.2	58.59	46	-5.8	11.65	1.85	31.89	100	119	Peak
298.65	40.54	57.4	46	-5.46	12.91	2.05	31.82	100	162	Peak
332.9	40.09	56	46	-5.91	13.73	2.17	31.81	100	132	Peak
499.5	32.62	44.16	46	-13.38	17.31	2.78	31.63	100	140	Peak
830.6	30	35.33	46	-16	22.62	3.77	31.72	100	124	Peak
ANTENNA POLARITY & test distance: VERTICAL at 3 m										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
185.79	31.68	51.56	43.5	-11.82	10.33	1.53	31.74	100	153	Peak
224.4	32.57	52.25	46	-13.43	10.38	1.71	31.77	100	139	Peak
257.88	35.28	53.58	46	-10.72	11.71	1.86	31.87	100	134	Peak
332.2	40.4	56.31	46	-5.6	13.73	2.17	31.81	100	185	QP
497.4	38.21	49.83	46	-7.79	17.27	2.77	31.66	100	193	QP
832	34.44	39.77	46	-11.56	22.64	3.77	31.74	100	104	Peak

**REMARKS:** Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor



802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 140	FREQUENCY RANGE	30MHz ~ 1GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	David Huang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
187.41	29.88	49.81	43.5	-13.62	10.26	1.53	31.72	100	154	Peak
255.72	31.8	50.19	46	-14.2	11.65	1.85	31.89	100	117	Peak
298.65	38.45	55.31	46	-7.55	12.91	2.05	31.82	100	163	Peak
332.9	39.47	55.38	46	-6.53	13.73	2.17	31.81	100	184	Peak
499.5	33.25	44.79	46	-12.75	17.31	2.78	31.63	100	120	Peak
832	29.52	34.85	46	-16.48	22.64	3.77	31.74	100	109	Peak
ANTENNA POLARITY & test distance: VERTICAL at 3 m										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
55.92	29.1	47.29	40	-10.9	12.35	0.8	31.34	100	107	Peak
184.98	30.14	49.99	43.5	-13.36	10.39	1.52	31.76	100	115	Peak
298.65	35.51	52.37	46	-10.49	12.91	2.05	31.82	100	325	Peak
333.6	40.54	56.43	46	-5.46	13.75	2.17	31.81	100	208	Peak
498.8	39.44	51.03	46	-6.56	17.29	2.77	31.65	100	263	QP
831.3	31.82	37.15	46	-14.18	22.63	3.77	31.73	100	186	Peak

**REMARKS:** Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

Mode C

802.11a

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 64	FREQUENCY RANGE	30MHz ~ 1GHz
INPUT POWER (SYSTEM)	120Vac, 60 Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	25deg. C, 65%RH	TESTED BY	David Huang

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
165	29.39	47.53	43.5	-14.11	12.25	1.42	31.81	100	154	Peak
257.61	31.94	50.24	46	-14.06	11.71	1.86	31.87	100	163	Peak
298.65	38.5	55.36	46	-7.5	12.91	2.05	31.82	100	184	Peak
332.9	40.79	56.7	46	-5.21	13.73	2.17	31.81	100	132	Peak
365.1	36.22	51.4	46	-9.78	14.49	2.28	31.95	100	117	Peak
498.1	31.51	43.1	46	-14.49	17.29	2.77	31.65	100	114	Peak
ANTENNA POLARITY & test distance: VERTICAL at 3 m										
FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	READ LEVEL (dBuV)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA FACTOR (dB/m)	CABLE LOSS (dB)	PREAMP FACTOR (dB)	ANTENNA HEIGHT (cm)	TABLE ANGLE (Degree)	REMARK
56.19	28.68	46.87	40	-11.32	12.35	0.8	31.34	100	154	Peak
184.17	30.38	50.17	43.5	-13.12	10.46	1.52	31.77	100	214	Peak
298.92	35.71	52.57	46	-10.29	12.91	2.05	31.82	100	139	Peak
<b>332.9</b>	<b>40.83</b>	<b>56.74</b>	<b>46</b>	<b>-5.17</b>	<b>13.73</b>	<b>2.17</b>	<b>31.81</b>	<b>100</b>	<b>185</b>	<b>Peak</b>
498.8	40.52	52.11	46	-5.48	17.29	2.77	31.65	100	263	QP
831.3	35.68	41.01	46	-10.32	22.63	3.77	31.73	100	104	Peak

REMARKS: Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor



## 5. PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).



## 6. INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

## **7. APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No modifications were made to the EUT by the lab during the test.

**---END---**